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**EP 0 402 465 A1**

(54) **DOOR MIRROR FOR AUTOMOBILES.**

(57) A folding door mirror for automobiles, in which a bearing member (16) receiving a shaft (12) of a mirror base (11) to be fixed to an automobile body is molded integrally with a mirror housing (13) of a synthetic resin. The bearing member is formed as a bearing cylinder on the inner side of the mirror housing, and the shaft is engaged with a receiving surface of the bearing cylinder and supports the mirror housing so that the mirror housing can be turned. U-shaped plate springs (36) are provided

between the inner surface of the bearing cylinder and the shaft, and one end portion of each of the plate springs is in contact with the inner surface of the bearing cylinder, the other end portion thereof contacting a flat surface (12d) formed on a part of the shaft. Owing to the frictional force occurring due to the resilient force of the springs, the turning of the mirror is prevented, so that the mirror housing can be held in a normal position. The shaft is provided at its free end portion with a stopper so that the mirror housing is not moved in the axial direction of the shaft. When a large external force is applied to the mirror housing, the contact portions of the plate springs and shaft are moved from the flat surface to the circumferential surface against the force of the springs, so that the mirror housing is turned slowly from the normal position to an inclined position.

FIG. 3

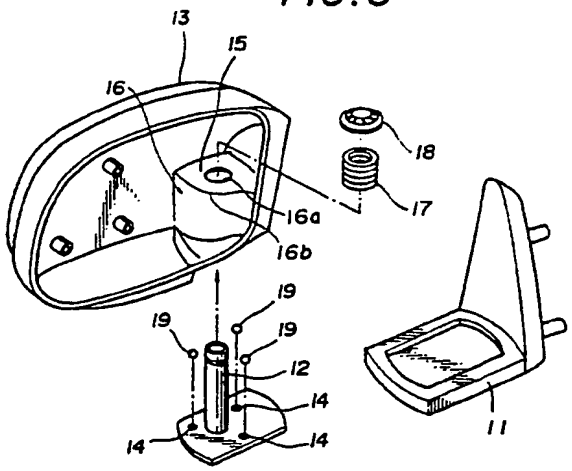
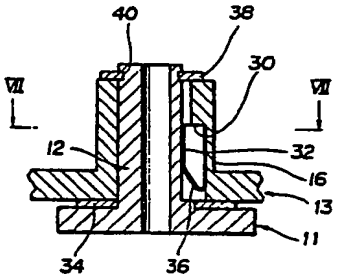



FIG. 6



SPECIFICATION

# Door Mirror for Vehicles

## FIELD OF THE INVENTION

The present invention relates to a door mirror for vehicles for the driver to obtain a rear view, and more particularly to an improved and novel mirror-housing supporting structure in a tiltable door mirror.

## BACKGROUND ART

In general door mirrors for vehicles, a mirror housing tiltably supporting a mirror is fixed on the door of the vehicle as projected therefrom. Nowadays, however, door mirrors of such a structure that the mirror housing itself is pivotable with respect to the mirror base are proposed and practically instead of the door mirrors having such a fixed mirror housing. A typical tiltable door mirror is disclosed in the Japanese Unexamined Utility Model Publication No. 61-190742, for example, as shown in Fig. 1. The disclosed door mirror has a mirror base 1 which is to be fixed on a vehicle door and on which a substantially vertical shaft 2 is fixed, and a mirror housing 3 having fixed thereon a bracket 5 on which there is installed a drive unit (not shown) for tilting a mirror body 4a on which a mirror 4 is fixed. As shown in Fig. 2, the bracket 5 has formed integrally therewith a bearing cylindrical portion 5a which supports the shaft 2. There is

disposed a compression coil spring 6 between the base of the bearing cylindrical portion 5a and a spring receiver 7 of which the outward movement from the shaft 2 is limited by a cir-clip 8 fixed on the end of the shaft 2. Also there is disposed a plurality of balls 9 between the bottom of the bracket 5 and the base of shaft 2. The balls 9 are housed in a concavity 2a formed in the base of the shaft 2, and since the bracket 5 is forced toward the base of the shaft 2 under the action of the coil spring 6, the mirror housing 3 is positioned in the normal position. When applied with a large external force, the mirror housing 3 is pivoted a predetermined angle against the force of the coil spring 6.

In the conventional tiltable door mirror of such type, the mirror housing 3 is made of a lightweight synthetic resin while the bracket 5 including the bearing cylindrical portion 5a is made of a metal, for example, aluminum die-casting, which will provide a large mechanical strength. Since both these members are mechanically coupled to each other, they will be a big weight as totaled. As aforementioned, the compression coil spring 6 for forcing the bracket 5 to the base of the shaft 2 is disposed between the base of the bearing cylindrical portion 5a and the spring receiver 7 and the plurality of balls 9 is disposed between the bottom of the bracket 5 and the base of the shaft 2, in order to provice a stepwise movement of the mirror housing 3. Therefore, the support structure for the mirror housing 3 is complicated and requires a high skill of the worker who installs the door mirror to the door of a

vehicle. Also, because of the support structure, the door mirror of such support structure cannot be easily installed in a short time.

The present invention has an object to overcome the above-mentioned drawbacks of the conventional tiltable door mirrors by providing a door mirror having an improved and novel mirror-housing supporting structure.

The present invention has another object to provide a door mirror having a mirror-housing supporting structure which consists of a reduced number of parts, is lightweight and has a high mechanical strength.

The present invention has a still another object to provide a door mirror having a simple mirror-housing supporting structure and which can be installed rapidly and easily.

## DISCLOSURE OF THE INVENTION

The door mirror according to the present invention comprises a mirror base to be fixed to the door of a vehicle and which has a substantially vertical shaft, synthetic resin-made mirror housing tiltably supporting a mirror and pivotably supported on a shaft of the mirror base, and a spring means which forces the mirror housing to the mirror base to maintain the mirror housing in the normal position, the mirror housing being pivotable from the normal position to a front or rear position with respect to the normal position when applied with an external force larger than a predetermined force corresponding to the elasticity of the spring means, the mirror housing having formed by an integral molding therein a bearing member

which bears the shaft of the mirror base.

Since the synthetic resin-made mirror housing and the bearing member which bears the mirror base shaft are formed together by the integral molding, their weight is extremely small and the mirror-housing supporting structure is very simple, which facilitates very much the installation of the door mirror.

The bearing member may be composed of a hollow inner cylindrical portion having formed thereon a bearing surface to bear the circumferential surface of the shaft, an outer cylindrical portion formed integrally with the inner cylindrical portion and opened at the lower end thereof, and a plurality of reinforcing ribs coupling the inner and outer cylindrical portions to each other and disposed radially, the end of the shaft being so constructed as to be inserted from a lower opening of the inner cylindrical portion and exposed outside of an upper opening thereof, the upper wall of the outer cylindrical portion being formed to have a flat surface substantially perpendicular to the shaft, the spring means being constructed in the form of a compression coil spring interposed between a spring receiving member fixed at the shaft end and the flat surface, whereby the bearing member can have an ample rigidity.

There may be interposed between the mirror housing and mirror base spherical members pivotably supporting the mirror housing around the shaft, the spherical members including three balls disposed in spaces defined by three small semispherical concavities formed on the mirror base and three essentially

semispherical concavities formed concentrically at each end of the reinforcing rib, the small semispherical concavities on the mirror base being provided corresponding to the normal position of the mirror housing and to front and rear positions with respect to the normal position.

Also, the shaft may be formed separately from or integrally with the mirror base. In case it is formed integrally with the mirror base, the door mirror can be easily installed on the car.

The bearing member may be formed by a bearing having a bearing surface to bear the circumferential surface of the shaft, the spring means being formed by a U-shaped leaf spring housed in the bearing, the leaf spring being so disposed as to be in contact, at the one end thereof, with the inner wall and at the outer wall with a flat surface formed at least a portion of the shaft and which is parallel to the axis of the shaft, a stopper being disposed at the end of the shaft to limit the axial movement of the mirror housing.

Since the leaf spring forces the circumferential surface of the shaft in a direction perpendicular to the axis, the circumferential surface is in close contact with the bearing surface of the bearing so that the frictional force helps to restrain the mirror housing including the bearing from pivoting about the shaft. Besides, since the leaf spring is disposed as housed in the bearing, it is easy to install the shaft in the bearing, and also since the mirror-housing supporting structure can be designed compact, the stopper provided at the shaft end

is not applied with any large stress so that the shaft will not be damaged. When the mirror housing is in the normal position, the leaf spring abuts the flat surface formed on the shaft, but when the mirror housing is applied with a large external force, the leaf spring shrinks and moves from the flat surface of the shaft to the circumferential surface and into contact with the latter, so that a part of the large external force applied to the mirror housing is absorbed and the mirror housing pivots slowly.

The leaf spring may be a pair of leaf springs which are provided opposite to each other around the shaft inside the bearing, the shaft being provided with a pair of fat surfaces receiving the leaf springs, respectively, whereby the mirror housing is more stably supported and maintained in the normal position.

These flat surfaces should preferably be formed by D-cut portions which are formed on the circumferential surface of the shaft.

The leaf spring has formed thereon a portion protruded toward the flat surface on the shaft, the flat surface having formed therein a concavity in which the protrusion is engaged, whereby the mirror housing can be more stably supported and maintained in the normal position.

The outer circumferential surface of the shaft corresponding to the path on which the protrusion is moved as the mirror housing is pivoted has formed therein two concavities, in addition to the above-mentioned concavity, in which the

protrusion is also engaged; the first concavity corresponding to the normal position of the mirror housing while the second concavities correspond to the front and rear positions, respectively, with respect to the normal position of the mirror housing. Thereby, the mirror housing can be positively maintained in the normal position and pivoted stepwisely.

The shaft is formed at a portion near the lower end thereof to have a large diameter and at a portion near the upper end to have a small diameter. The portion between these large- and small-diameter cylindrical surfaces is formed to have a conical surface of which a part may be formed to be parallel to the axis of the shaft. Furthermore, the bearing may be formed to have bearing surfaces which bear the large- and small-diameter cylindrical surfaces and the conical surface, respectively. Thereby, it is easier to install the shaft into the bearing.

The stopper may be formed by a pair of pawls formed at the end of the shaft, the end of the shaft inserted from the lower opening of the bearing preferably being engaged on the edge of the upper opening of the bearing when the shaft end is exposed from the upper opening of the bearing.

The spring means may be formed by an elastic member, instead of the leaf spring, wrapped with a lubricating synthetic resin and which is disposed in a pocket area defined by a concavity formed in a portion of the conical surface of the shaft and a concavity formed opposite to that concavity inside the bearing.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective exploded view schematically showing the construction of the conventional tiltable door mirror;

Fig. 2 is a sectional view showing the essential portion in Fig. 1;

Figs. 3 thru 5 show a first embodiment of the door mirror according to the present invention; of which Fig. 3 being a perspective exploded view schematically showing the construction of the door mirror, Fig. 4 being a bottom view of the essential portion in Fig. 3, and Fig. 5 being a sectional view of the essential portion in Fig. 3;

Figs. 6 thru 8 show a second embodiment of the door mirror according to the present invention; of which Fig. 6 being a sectional view of the essential portion of the door mirror, Fig. 7 being a sectional view taken along the line VII-VII and schematically showing the mirror-housing supporting structure, and Fig. 8 being a sectional view for explanation of the function of the mirror-housing supporting structure;

Figs. 9 and 10 show a third embodiment of the door mirror according to the present invention; of which Fig. 9 being a sectional view of the essential portion of the door mirror showing the two leaf springs provided, and Fig. 10 being a section view taken along the line X-X in Fig. 9;

Figs. 11 thru 14 show a fourth embodiment of the door mirror according to the present invention; of which Fig. 11 being a sectional view of the door mirror, Fig. 12 being a sectional view taken along the line XII-XII in Fig. 11, Fig. 13

being a perspective view, enlarged in scale, of the form of the leaf spring, and Fig. 14 being a sectional view for explanation of the function of the mirror-housing supporting structure shown in Fig. 12;

Figs. 15 and 16 show a fifth embodiment of the door mirror according to the present invention; of which Fig. 15 being a sectional view showing the essential portion of the door mirror, and Fig. 16 being a sectional view taken along the line XVI-XVI in Fig. 15;

Figs. 17 and 18 show a sixth embodiment of the door mirror according to the present invention; of which Fig. 17 being a sectional view of the essential portion showing the mirror-housing supporting structure of the door mirror, and Fig. 18 being a schematic perspective exploded view of the mirror-housing supporting structure shown in Fig. 17;

Figs. 19 and 20 show a seventh embodiment of the door mirror according to the present invention, of which Fig. 19 being a sectional view of the essential portion showing the mirror-housing supporting structure of the door mirror, and Fig. 20 being a schematic perspective exploded view of the mirror-housing supporting structure shown in Fig. 19;

Fig. 21 is a sectional view of the essential portion of the door mirror showing an eighth embodiment of the door mirror according to the present invention;

Fig. 22 is a sectional view of the essential portion showing a variant in which a friction-preventive ring is provided between the pair of leaf springs and the shaft in Fig.

21;

Figs. 23 thru 26 show a ninth embodiment of the door mirror according to the present invention, of which Fig. 23 being a sectional view of the essential portion of the door mirror, Fig. 24 being a schematic perspective exploded view of the mirror-housing supporting structure shown in Fig. 23, Fig. 25 being a sectional view taken along the line XXV-XXV in Fig. 23, and Fig. and 26 being a sectional view for explanation of the action of the elastic member surrounded by the lubricating synthetic resin shown in Fig. 25.

## BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to Figs. 3 thru 5, the first embodiment of the door mirror according to the present invention will be described. In Fig. 3, the reference numeral 11 indicates a mirror base to be fixed to the door of a vehicle and to which a shaft 12 is integrally secured. The door mirror has a mirror housing 13 made of a synthetic resin and which is to be installed to a drive unit (not shown) which tiltably supports a mirror (not shown). A bearing member 16 having a bearing surface which bears the shaft 12 is integrally formed with the mirror housing 13. The bearing member 16 is composed of a hollow inner cylindrical portion 16a having formed thereon a bearing surface which bears the circumferential surface of the shaft 12, an outer cylindrical portion 16b formed surrounding the inner cylindrical portion 16a, integrally therewith and opened at the lower end thereof, and three reinforcing ribs 22 radially disposed to couple the inner cylindrical portion 16a

and outer cylindrical portion 16b with each other. Each reinforcing rib 22 has formed on the bottom thereof a generally semispherical concavity 23 as shown in Fig. 3. On the other hand, the shaft 12 has formed on the base thereof three small-diameter semispherical concavities 14 correspondingly to the semispherical concavities 23. When the mirror housing 12 is in the normal position, the balls 19 are within the respective spaces defined by the mating concavities. The length of the shaft 12 is selected to be larger than that of the inner cylindrical portion 16a so that when the shaft 12 is inserted in the inner cylindrical portion 16, it will be exposed from the upper opening. The shaft 12 has a push nut 18 fixed at the end thereof, and a compression coil spring 17 is interposed between the push nut 18 and the generally flat upper wall of the outer cylindrical portion 16b. The push nut 18 and the flat upper wall of the outer cylindrical portion 16b form together a spring receiver and the bearing member 16 is forced toward the base of the shaft 12 under the action of the spring. When the mirror housing 13 is in the normal position, all the three balls 19 stay in the respective three concavities 14. However, when the mirror housing 13 is moved to a front or read position with respect to the normal position, only one of the three balls 19 moves from its concavity 14 to an adjoining concavity while the other two balls 19 go out of their respective concavities 14. Thus, when the mirror housing 13 is in the normal position, it is positively positioned there by the three balls 19 and under the action of the friction due to the

force of the compression coil spring 17. In this embodiment, the bearing member 16 is composed of the hollow inner cylindrical portion 16a molded integrally with the mirror housing 13 and the outer cylindrical portion 16b surrounding the inner cylindrical portion. Since both these cylindrical portions are coupled with each other by means of the plural reinforcing ribs 22, the rigidity of the bearing member as a whole can be increased and the mirror housing 13 can be positively held.

Figs. 6 thru 8 show a second embodiment. In these Figures, the same or like elements as in the first embodiment are indicated with the same or like reference numerals.

In Fig. 6, the shaft 12 is shown as separated from the mirror base 11 for the simplicity of illustration, but they are formed integrally with each other in practice. The bearing member 16 is formed integrally with the mirror housing 13. It is made in the form of a bearing having a bearing surface which bears the circumferential surface of the shaft 12. The shaft 12 has a part thereof cut into a flat surface parallel to the axis thereof as shown in Fig. 7. Namely, the part is formed to be a D-cut flat surface 32. The bearing 16 has provided therein an inner space 30 in which a U-shaped leaf spring 30 is provided. The leaf spring 36 is in contact, at the one end thereof, with the inner wall parallel to the axis and which defines the inner space 30 and at the other end with the D-cut flat surface 32. The circumferential surface of the shaft 12 abuts the bearing surface of the bearing 16 under the force of

the lead spring 36. The reference numeral 34 indicates a circular friction disc interposed between the bottom of the bearing 16 and the base of the shaft 12, and the bearing 16 is held in face contact with the shaft 12 by means of the leaf spring 34 and the friction disk 36. Further, the shaft 12 has a length selected to be slightly larger than the height of the bearing 16 and has formed near the end thereof a circular recess 40 in which a cir-clip 38 is fitted. The cir-clip 38 is fitted into the recess 40 after the shaft 12 is inserted into the bearing 16, to limit the bearing 16 from moving axially. As shown in Fig. 7, when the mirror housing 13 is in the normal position, the shaft 12 is forced by a big force of the leaf spring 36 in a direction perpendicular to the axis and limited by the cir-clip 38 and friction disc 34 from moving axially, whereby the mirror housing 13 is securely held by the mirror base 11. When the mirror housing 13 is applied with a big external force, the leaf spring 36 moves from the flat surface 32 of the shaft into contact with the circumferential surface thereof while being contracted and the bottom of the bearing 16 is rotated while being in contact with the friction disc 34, so that the mirror housing 13 pivots slowly correspondingly to the direction of the external force. In this embodiment, since the construction of the conventional tiltable door mirror in which the bearing member is forced toward the base of the shaft by means of a compression coil spring is not adopted, the mirror-housing supporting structure is simple, no deformation due to stress occurs and the door mirror assembly thus formed can be

easily installed to the vechicle door. This embodiment has a special feature that the lead spring 36 is housed in the bearing 16 and the shaft 12 is forced against the bearing surface of the bearing 16. Namely, the shaft 12 is forced horizontally, so that the shaft 12 can be fitted into the bearing 16 by a single operation and the installion can be done without any skill. Thus, the installation of the door mirror can be automated.

Figs. 9 and 10 show a third embodiment in which leaf springs 36 in pair are disposed opposite to each other around the shaft 12 in the space 30 defined in the bearing 16. The circumferential surface of the shaft 12 is partially formed as flat surfaces, namely, D-cut flat surfaces, with which the leaf springs 36 in pair are in contact, respectively, the remainder of the circumferential surface being in contact with the bearing surface of the bearing 16. In this embodiment, since the two flat surfaces are forced in the opposite directions by the leaf springs 36, respectively, the mirror housing 12, when in the normal position as shown in Fig. 10, can be more positively held by the shaft 12, namely, by the mirror base, than in case a single leaf spring 36 is used. Namely, only when a larger external force is applied to the mirror housing 13 than in case the single leaf spring 36 is used, the mirror housing 13 is slowly pivoted.

Figs. 11 thru 14 show a fourth embodiment. In this embodiment, a single leaf spring 36 is used as in the second embodiment, but as shown, as enlarged in scale, in Fig. 13, the

leaf spring 36 has the one end thereof formed as a flat surface so as to be in contact with the inner wall of the bearing 16 which defines the housing space 30 and the other end of the leaf spring 36 has formed as a protrusion 36a a part of the flat surface which is in contact with the D-cut flat surface 32 of the shaft 12. On the other hand, the D-cut flat surface 32 of the shaft 12 has formed thereon a concavity 44a in which the protrusion 36a is engaged. Therefore, since the shaft 12 is formed against the bearing surface of the bearing 16 with the protrusion 36a of the leaf spring 36 engaged in the concavity 44a of the shaft 12 when the mirror housing 13 is in the normal position as shown in Fig. 12, the friction between the bearing 16 and shaft 12 provides a positive holding of the mirror housing 12 with respect to the mirror base 11. If the mirror housing 13 is applied with a big external force, for example, in case the mirror housing 13 is turned frontward or rearward to avoid any obstacle, for example, when the vehicle is driven in a narrow place, the protrusion 36a of the leaf spring 36 and the concavity 44a in the shaft 12 are disengaged from each other and the bearing 16 is slowly pivoted with the protrusion 36a being in contact with the circumferential surface of the shaft 12. At this time, the leaf spring 36 is pivoted while being contracted. In case the mirror housing 13 is returned to the initial normal position from the turned position, it is automatically positioned by pivoting it in an opposite direction until the protrusion 36a is engaged into the concavity 44a in the shaft 12. As shown with dot line in Figs. 12 and 14,

other concavities 44b and 44c may be formed, in addition to the concavity 44a, in the circumferential surface of the shaft 12 corresponding to the path of the protrusion 36a. The concavities 44b and 44c should preferably be formed correspondingly to the front and rear positions with respect to the normal position of the mirror housing 13 so that when the mirror housing 13 is applied with a big external force, it is stopped at either of such positions from pivoting.

Figs. 15 and 16 show a fifth embodiment in which two leaf springs 36 each having the protrusion 36a as shown in the fourth embodiment are housed around the shaft 12 in the bearing 16. The circumferential surface of the shaft 12 is partially formed into two D-cut flat surfaces 32 parallel to each other on which concavities 44 are formed, respectively, in which the two protrusions 36 of the leaf springs 36 are engaged, respectively. The concavity 44 takes the form of an elongated recess formed to a length corresponding to the length of the shaft 12 and axially of the shaft 12. However, the concavity is not limited only to the above, but it may be a one having such a width and length that the protrusion 36a can be engaged in it. Since the mirror-housing supporting structure in this embodiment can provide a rotation torque nearly double that in the fourth embodiment, the mirror housing 13 can be more securely held with respect to the mirror base 11.

Figs. 17 and 18 show a sixth embodiment in which the shaft 12 has a circumferential surface composed of a large-diameter cylindrical surface 12a rising from the base which is to be

secured to the mirror base 11, a small-diameter cylindrical surface 12b located near the end of the shaft 12 and a conical surface 13c contiguous to the large-diameter cylindrical surface 12a and small-diameter cylindrical surface 12b. Also the inner surface of the bearing 16 is composed of a large-diameter bearing surface 16a fitting the circumferential surface of the shaft 12, a small-diameter bearing surface 16b and a conical bearing surface 16c contiguous to the large-diameter bearing surface 16a and small-diameter bearing surface 16b. A part of the conical surface 12c is formed into a flat surface 12d parallel to the generating line of the conical surface 12c. When the mirror housing 12 is in the normal position, the leaf spring 36 is in contact at the end of thereof with the flat surface 12d and at the other end with the nearly vertical inner wall of the bearing 16. Since the leaf spring 36 is in contact at the one end thereof with the nearly vertical flat surface and at the other end with the flat surface parallel to the generating line of the conical surface, the bearing 16 is applied with a force which pushes up the shaft 12 obliquely, but the cir-clip 38 secured to the end of the shaft restains the bearing 16 from being moved under such force.

In this embodiment, the large-diameter cylindrical surface 12a rising from the base of the shaft 12 and the small-diameter cylindrical surface 12b located near the shaft end are both directed axially, and also the bearing surfaces 16a and 16b adjoining the upper and lower openings, respectively, of the bearing 16 are both directed axially, so that the shaft 12 is

in close contact with the bearing 16. The shaft 12 can be easily fitted into the bearing 16 by housing the leaf spring 36 within the housing space 30 in the bearing 16 beforehand, then inserting the end of the shaft 12 into the bearing 16 from the lower opening thereof.

Figs. 19 and 20 show a seventh embodiment in which a pair of pawl pieces 50 is provided at the end of the shaft 12 as a variant of the cir-clip 38 in the sixth embodiment. These pawl pieces 50 are formed integrally with the shaft 12 by an integral molding. Each of the pawl pieces 50 is inserted in the bearing 16 and when the end of the pawl piece 50 passes by the upper opening of the bearing 16, it is pushed inwardly by the cylindrical bearing surface 16b. After it passes by the upper opening of the bearing 16, it is engaged on the edge of the upper opening of the bearing 16. To this end, either side of each pawl piece 50 has an axial cut formed therein to have some elasticity. In this embodiment, a pair of pawl pieces 50 is provided; however, this number of pawl pieces is not limited to a pair but three or four pawl pieces may be used. The feature of the embodiment lies in that since the mirror-housing supporting structure is extremely simplified, it is possible to install the shaft 12 into the bearing 16 very rapidly and easily.

Fig. 21 shows an eighth embodiment in which two pieces of leaf springs 36 in the seventh embodiment. The housing spaces in which these two leaf springs 36 are disposed are located opposite to each other around the shaft 12. In this embodi-

ment, the lower opening of the bearing 16 defines the housing space 30. Each leaf spring 36 is in contact at the one end thereof with the flat surface 12d formed on the conical surface 12c of the shaft 12 and at the other end with the nearly vertical inner surface of the bearing 16, whereby the mirror housing 12 can be securely held in the normal position and can withstand a high wind pressure.

As shown in Fig. 22, flat surfaces 12d in pair are formed opposite to each other on the large-diameter cylindrical surface 12a of the shaft and a metallic ring 52 is disposed surrounding the large-diameter cylindrical surface 12a. Therefore, the pair of leaf springs 36 will force the shaft by means of the metallic ring 52, whereby it is possible to reduce the abrasion due to the friction between the shaft 12 and leaf springs 36.

Figs. 23 thru 26 show a ninth embodiment in which an elastic member 58 wrapped with a lubricating synthetic resin 56 is used as the spring means in place of the leaf spring 36 in the seventh embodiment. For housing the elastic member 58 wrapped with the lubricating synthetic resin 56, a concavity 54 is formed in a part of the conical surface 12c of the shaft 12 and also there is formed a concavity 53 inside the bearing 16 in a position opposite to the concavity 54, namely, a concavity corresponding to the housing space for the leaf spring 36 in the seventh embodiment, these concavities 54 and 53 defining a pocket area. The elastic member 58 is formed by a ball made of a silicon synthetic resin. As the lubricating synthetic resin

56, polyoxyethylene, for example, is selected. The elastic member 58 disposed as housed in the pocket area and wrapped with the lubricating synthetic resin 56 takes a somewhat crushed form as shown in Fig. 25 and forces the concavities 53 and 54, when the mirror housing 13 is in the normal position. When the bearing 16 is pivoted about the shaft 12, the elastic member 58 wrapped with the lubricating synthetic resin 56 is moved as deformed within the small space defined by the conical surface 12c of the shaft 12 and the concavity 53 in the bearing 16, takes a flat form as shown in Fig. 26 and will force the shaft 12 with a larger elasticity. Therefore, when the bearing 16, namely, the mirror housing 13, is in the normal position, the shaft 12 is held in the normal position as forced against the bearing surface of the bearing 16 with a predetermined elasticity. For pivoting the mirror housing 13 from the normal position to a front or rear position with respect to the normal position, the mirror housing 13 must be applied with a larger external force. In this embodiment, since an elastic member made of a silicon synthetic resin or the like as the spring means is wrapped with the lubricating synthetic resin 56, the mirror housing 14 can be pivoted calmly and will not be worn out early. In this embodiment, the shape of the elastic member 58 takes the form of a ball before crushed, but as obvious to those skilled in the art, the shape may be oval or any other one which has a curved surface similar to the ball.

What is claimed is:

1. A door mirror for vehicles having a mirror base to be fixed to the door of a vehicle and which has a substantially vertical shaft, a synthetic resin-made mirror housing tiltably supporting a mirror and pivotably supported on a shaft of said mirror base, and spring means which forces the mirror housing to the mirror base to maintain the mirror housing in the normal position, said mirror housing being pivotable from the normal position to a front or rear position with respect to the normal position when applied with an external force larger than a predetermined force corresponding to the elasticity of said spring means, said mirror housing having formed by an integral molding therein a bearing member which bears the shaft of said mirror base.

2. The door mirror for vehicles according to Claim 1, wherein said bearing member may be composed of a hollow inner cylindrical portion having formed thereon a bearing surface to bear the circumferential surface of said shaft, an outer cylindrical portion formed integrally with said inner cylindrical portion and opened at the lower end thereof, and a plurality of reinforcing ribs coupling said inner and outer cylindrical portions to each other and disposed radially, the end of said shaft being so constructed as to be inserted from a lower opening of said inner cylindrical portion and exposed outside of an upper opening thereof, the upper wall of said outer cylindrical portion being formed to have a flat surface

substantially perpendicular to said shaft, said spring means being constructed in the form of a compression coil spring interposed between a spring receiving member fixed at the end of said shaft end and said flat surface.

3. The door mirror for vehicles according to Claim 2, wherein there may be interposed between said mirror housing and mirror base spherical members pivotably supporting said mirror housing around said shaft, said spherical members including three balls disposed in spaces defined by three small semi-spherical concavities formed on said mirror base and three essentially semispherical concavities formed concentrically at each end of said reinforcing rib, the small semispherical concavities on said mirror base being provided corresponding to the normal position of said mirror housing and to front and rear positions with respect to the normal position.

4. The door mirror for vehicles according to Claim 2, wherein said shaft is formed integrally with said mirror base.

5. The door mirror for vehicles according to Claim 1, wherein said bearing member is formed by a bearing having a bearing surface to bear the circumferential surface of said shaft, the end of said shaft being inserted from the lower opening of said bearing and exposed outside the upper opening of said bearing, said spring means being formed by a U-shaped leaf spring housed in said bearing, said leaf spring being so

disposed as to be in contact, at the one end thereof, with the inner wall and at the outer wall with a flat surface formed at least a portion of said shaft and which is parallel to the axis of said shaft, a stopper being disposed at the end of said shaft to limit the axial movement of said mirror housing.

6. The door mirror for vehicles according to Claim 5, wherein said flat surfaces are formed by D-cut portions formed on the circumferential surface of said shaft.

7. The door mirror for vehicles according to Claim 5, wherein said leaf spring has formed on said other end thereof a portion protruded toward said flat surface on said shaft, said flat surface having formed therein a concavity in which said protrusion is engaged.

8. The door mirror for vehicles according to Claim 7, wherein said outer circumferential surface of said shaft corresponding to the path on which said protrusion is moved as said mirror housing is pivoted has formed therein two concavities, in addition to said concavity, in which said protrusion is engaged; said first concavity corresponding to the normal position of said mirror housing while said other two concavities correspond to front and rear positions with respect to said normal position of said mirror housing.

9. The door mirror for vehicles according to Claim 1,

wherein said leaf spring is formed as a pair of leaf springs which are provided opposite to each other around said shaft inside said bearing, each of said leaf springs being in contact at the one end thereof with the inner wall of said bearing while the other end is in contact with a pair of flat surfaces formed at least at a portion of said shaft and which are parallel to the axis of said shaft.

10. The door mirror for vehicles according to Claim 9, wherein said leaf spring has formed thereon a portion protruded toward said flat surface on said shaft, said flat surface having formed therein a concavity in which said protrusion is engaged.

11. The door mirror for vehicles according to Claim 5, wherein said shaft is formed at a portion near the lower end thereof to have a large diameter and at a portion near the upper end to have a small diameter, the portion between these large- and small-diameter cylindrical surfaces being formed to have a conical surface of which a part is formed to be parallel to the axis of said shaft, and said bearing being formed to have bearing surfaces which bear said large- and small-diameter cylindrical surfaces and said conical surface, respectively.

12. The door mirror for vehicles according to Claim 11, wherein said stopper is formed by a pair of pawls formed at the end of said shaft, the end of said shaft inserted from the

lower opening of said bearing preferably being engaged on the edge of the upper opening of said bearing when said shaft end is exposed from the upper opening of said bearing.

13. The door mirror for vehicles according to Claim 12, wherein said leaf spring is formed as a pair of leaf springs which are provided opposite to each other around said shaft inside said bearing, each of said leaf springs being in contact at the one end thereof with the inner wall of said bearing while the other end is in contact with a pair of flat surfaces formed at least at a portion of said shaft and which are parallel to the axis of said shaft.

14. The door mirror for vehicles according to Claim 12, wherein said shaft is formed integrally with said mirror base.

15. The door mirror for vehicles according to Claim 1, wherein said shaft is formed at a portion near the lower end thereof to have a large diameter and at a portion near the upper end to have a small diameter, the portion between these large- and small-diameter cylindrical surfaces being formed to have a conical surface of which a part is formed to be parallel to the axis of said shaft, and said bearing being formed to have bearing surfaces which bear said large- and small-diameter cylindrical surfaces and said conical surface, respectively; said leaf spring being so disposed as to be in contact, at the one end thereof, with the inner wall and at the outer wall with

a flat surface formed at least a portion of said shaft and which is parallel to the axis of said shaft, a stopper being disposed at the end of said shaft to limit the axial movement of said mirror housing.

16. The door mirror for vehicles according to Claim 15, wherein said stopper is formed by a pair of pawls formed at the end of said shaft, the end of said shaft inserted from the lower opening of said bearing preferably being engaged on the edge of the upper opening of said bearing when said shaft end is exposed from the upper opening of said bearing.

17. The door mirror for vehicles according to Claim 15, wherein said shaft is formed integrally with said mirror base.

FIG. 1

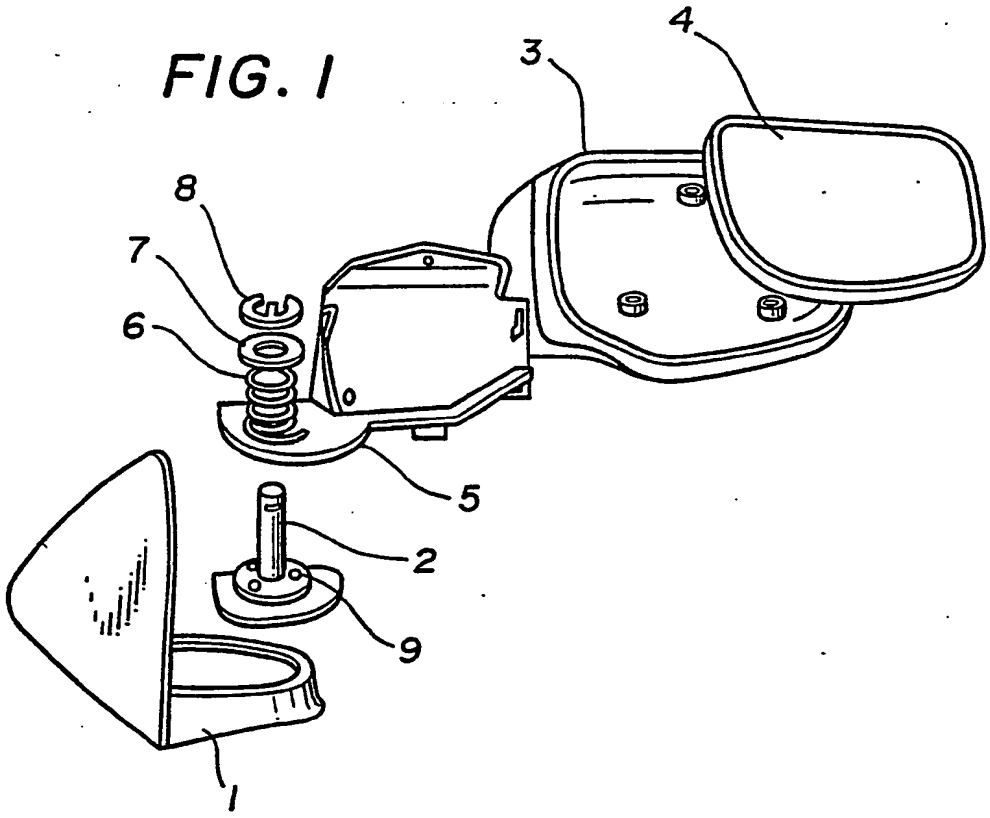



FIG. 2

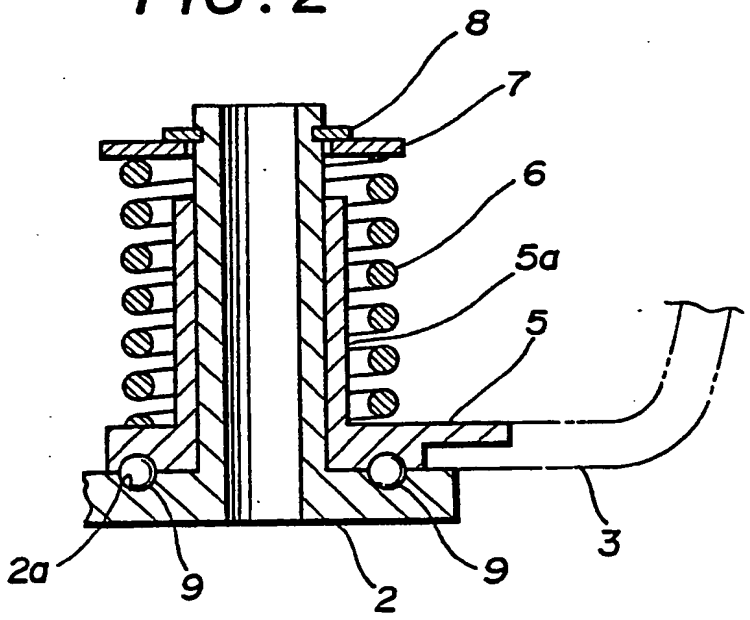


FIG. 3

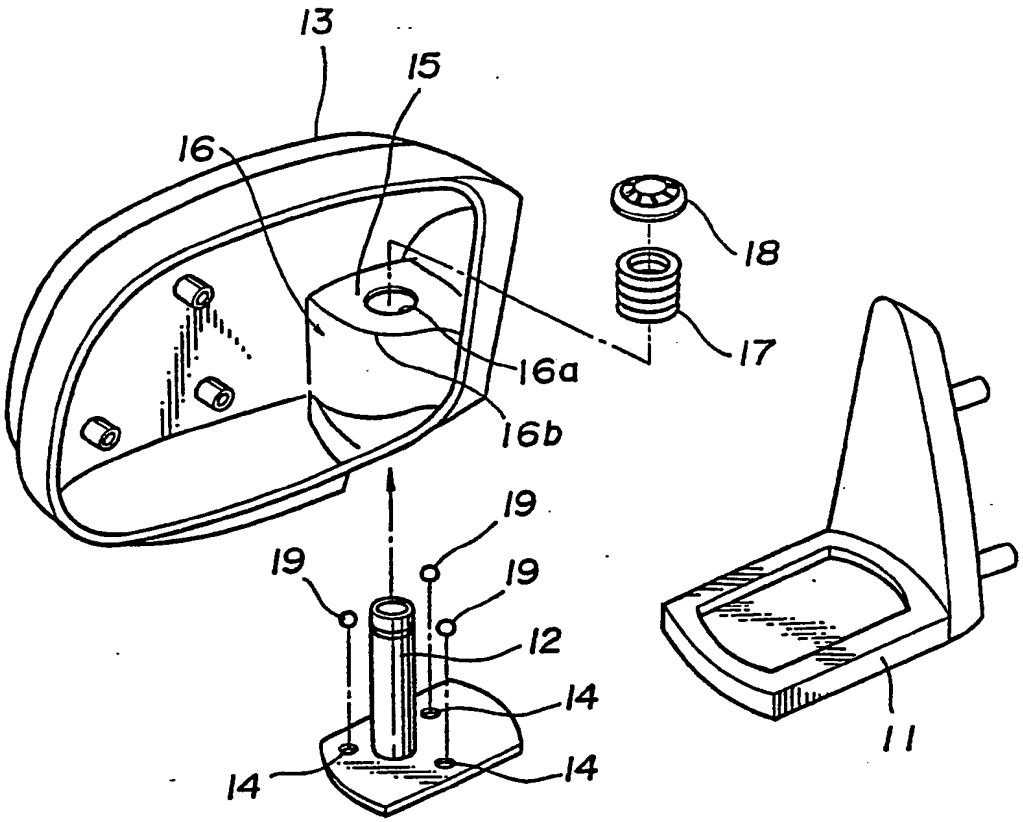



FIG. 4

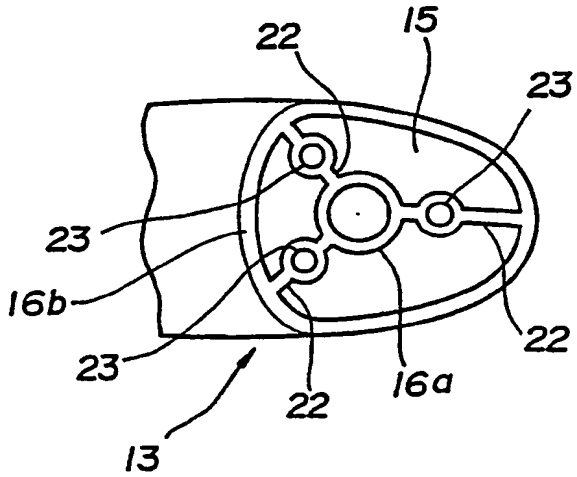


FIG. 5

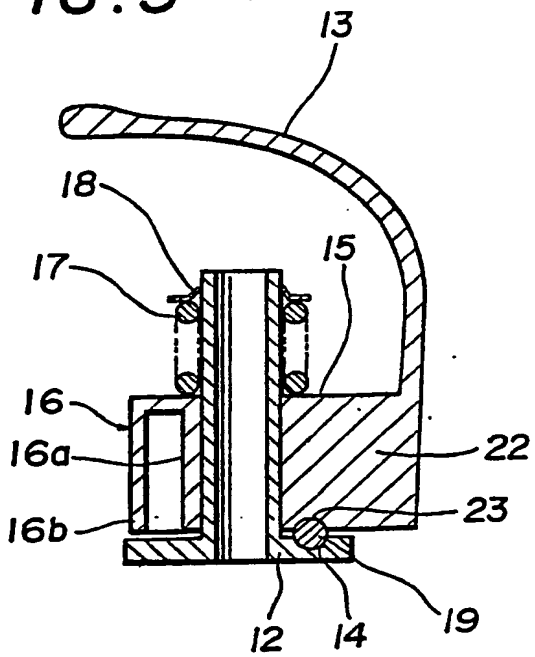



FIG. 6

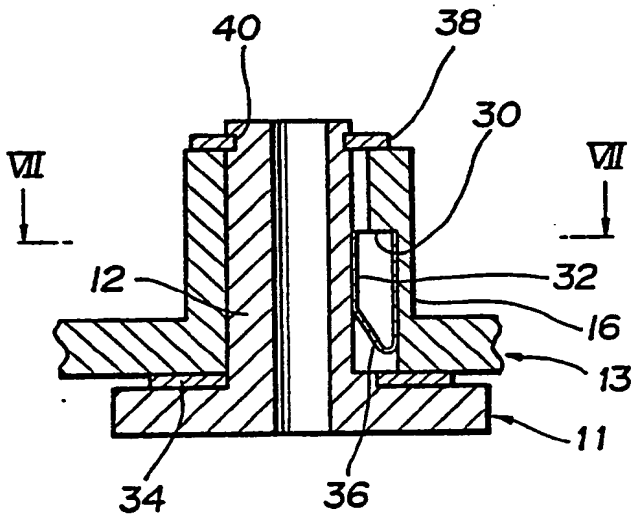


FIG. 7

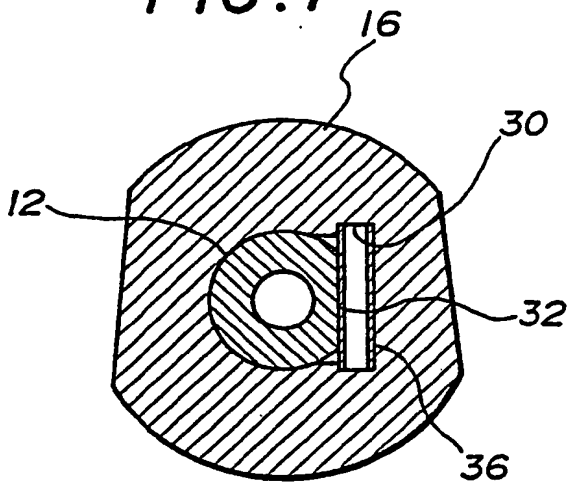



FIG. 8

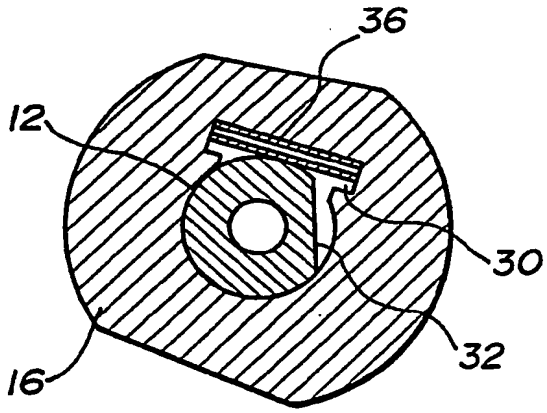


FIG. 9

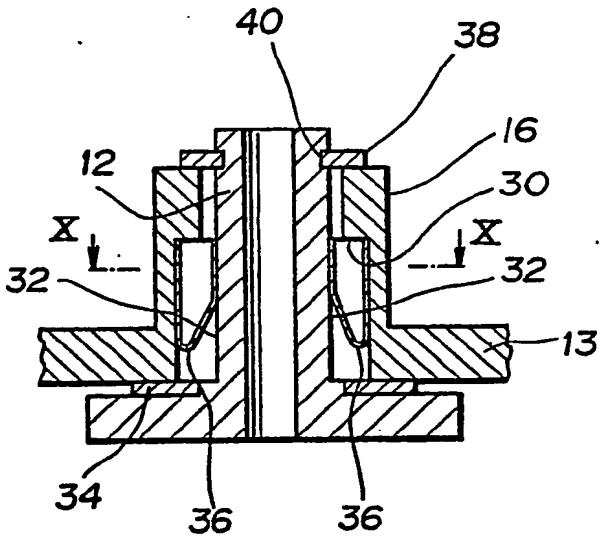



FIG. 10

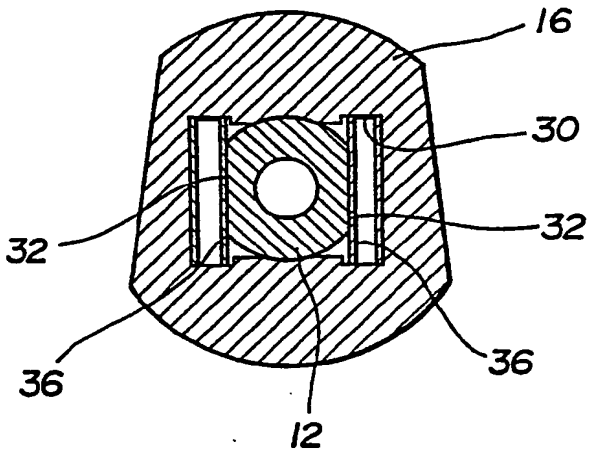


FIG. 11

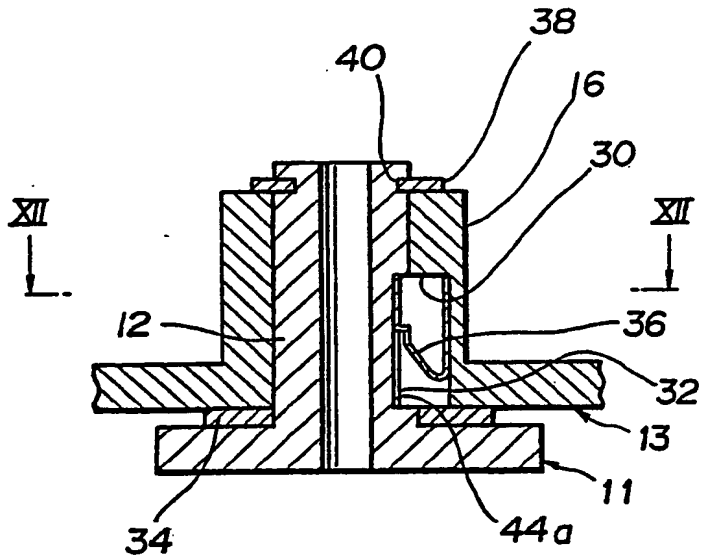



FIG. 12

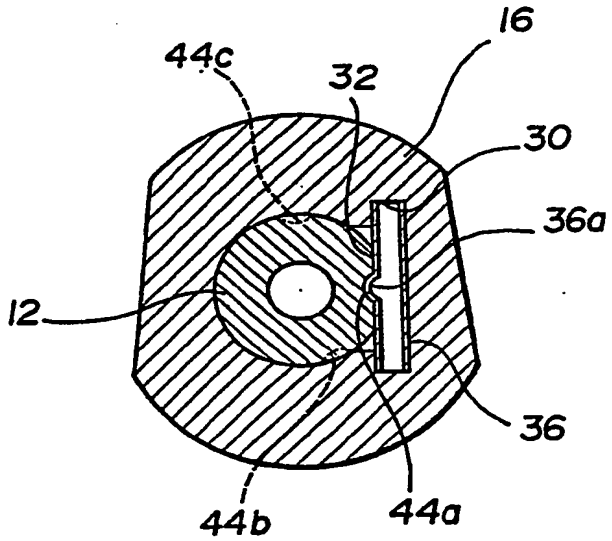


FIG. 13

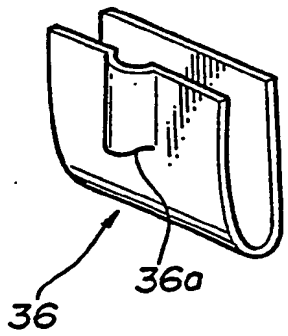



FIG. 14

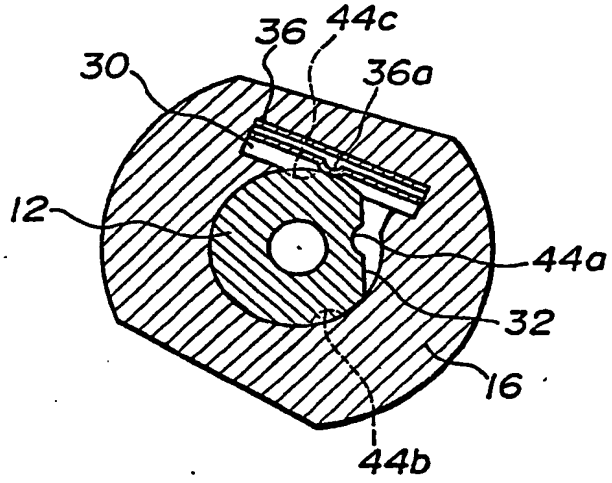


FIG. 15

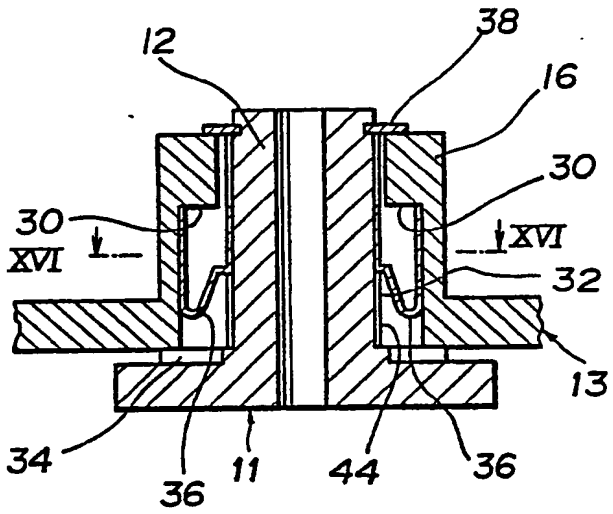



FIG. 16

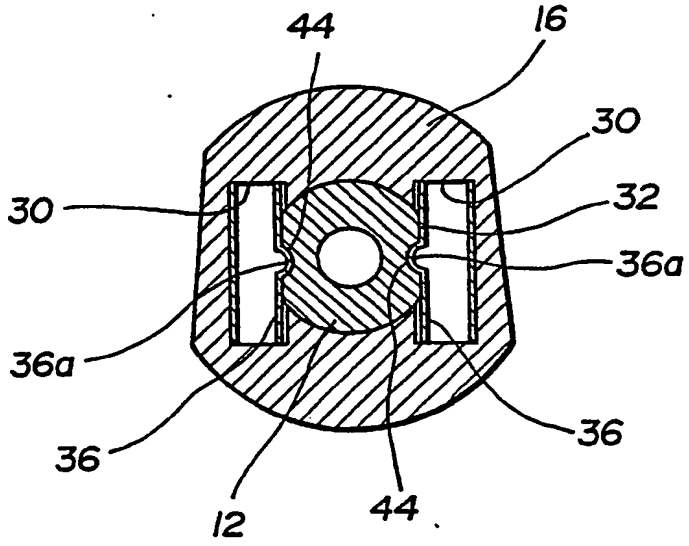


FIG. 17

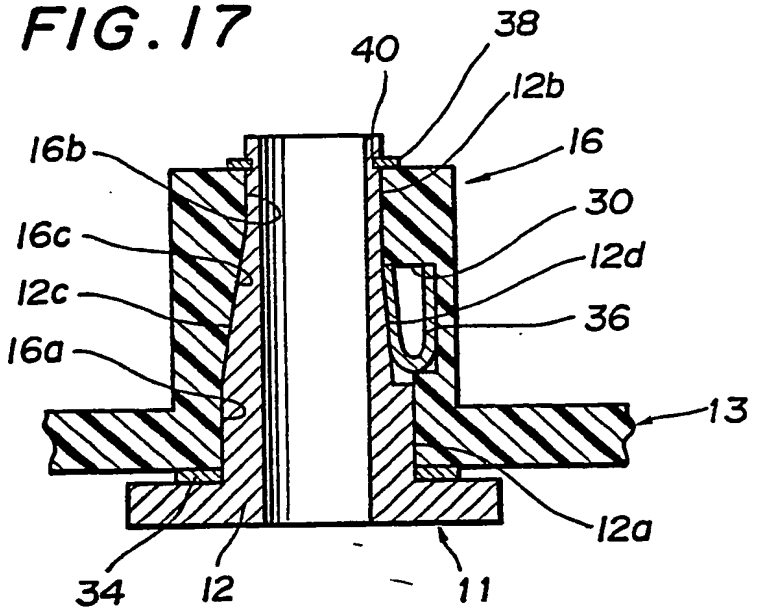

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FIG. 18

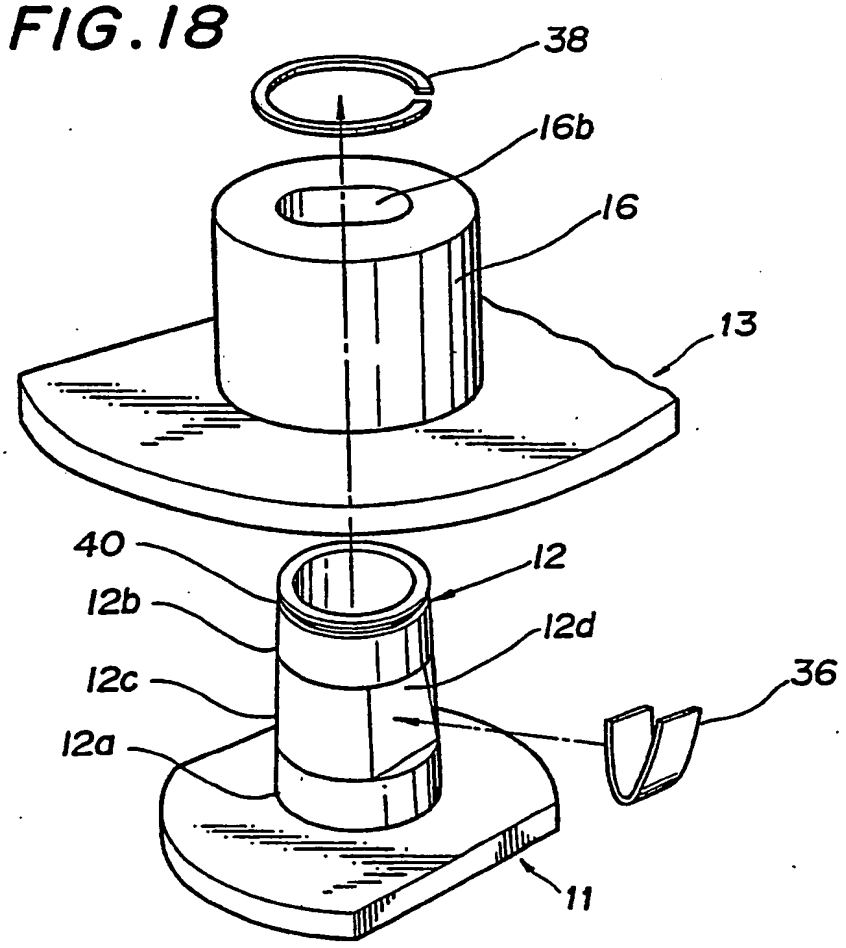
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FIG. 19

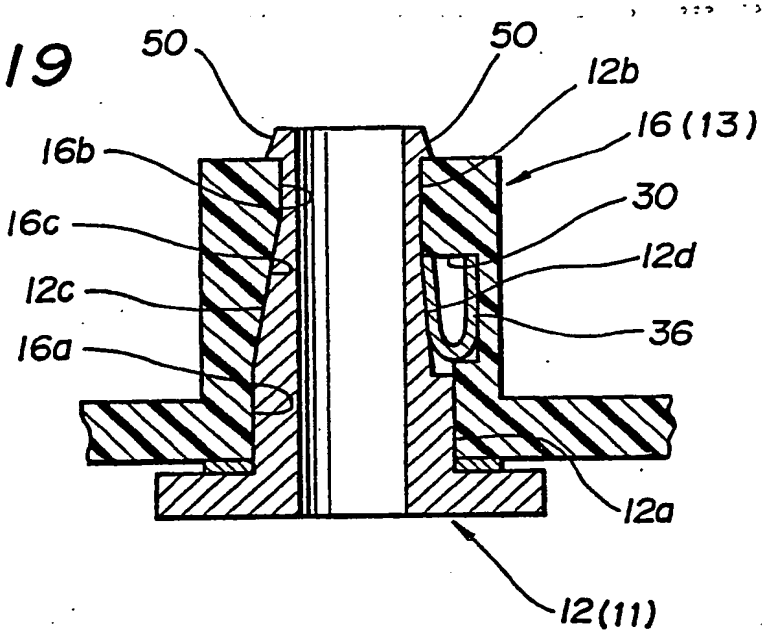



FIG. 20

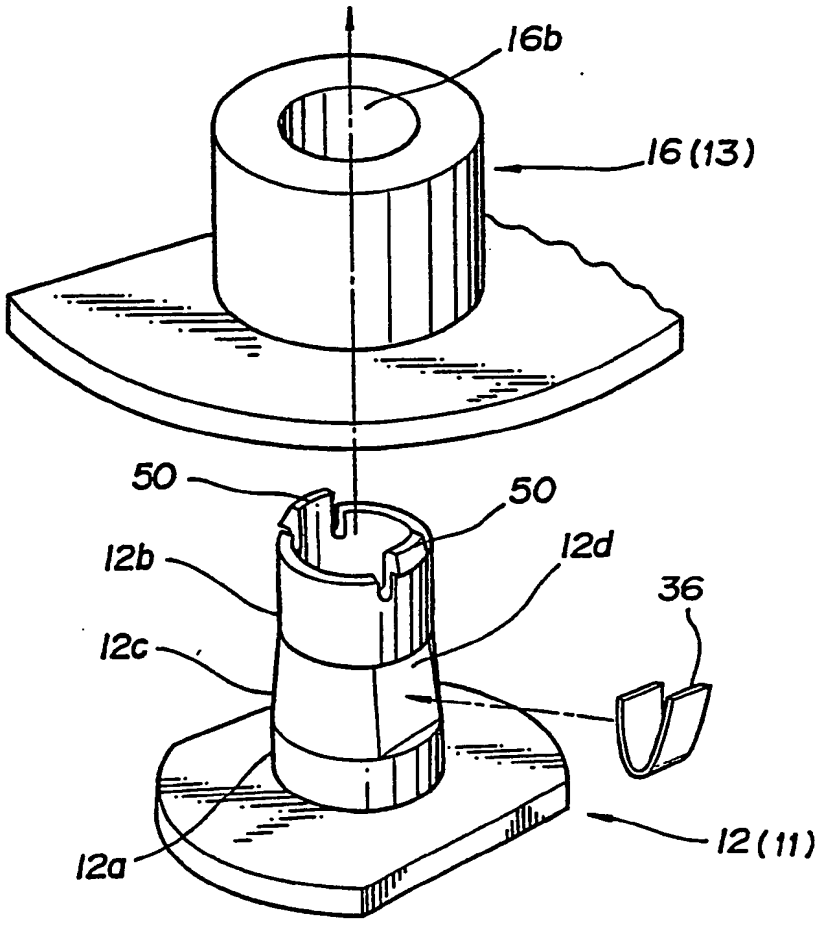
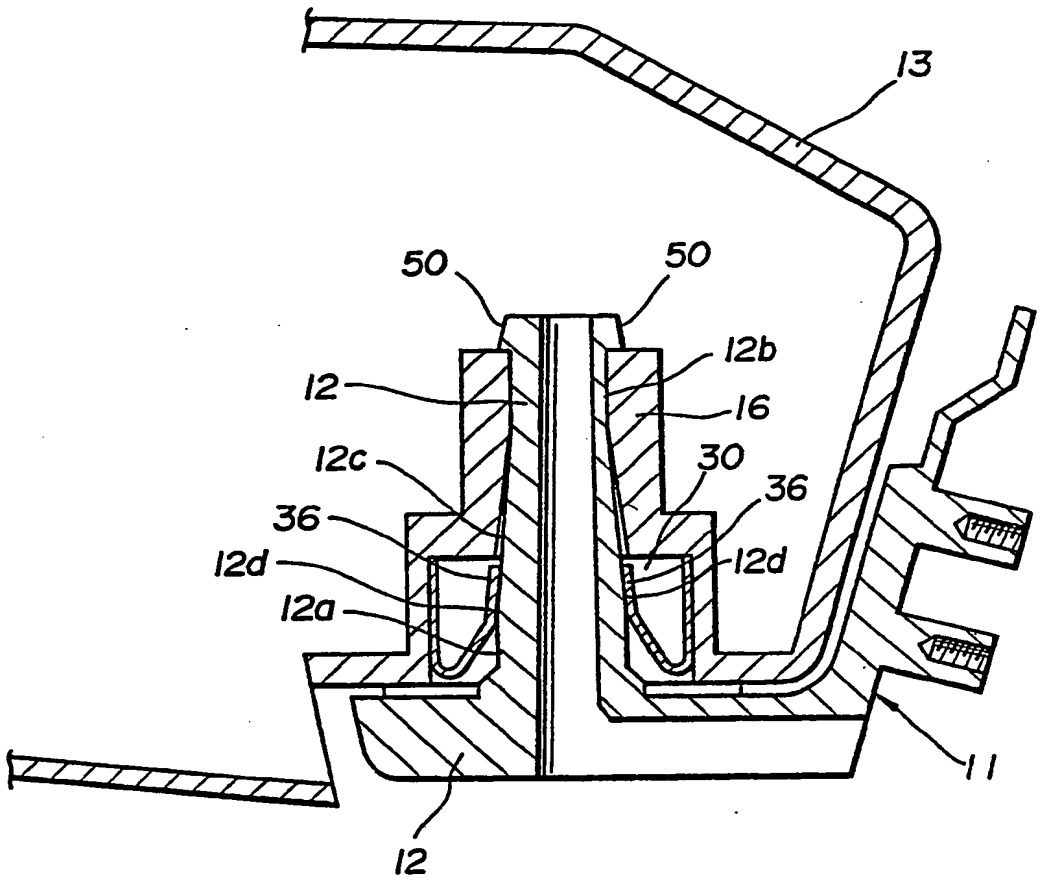


FIG. 21



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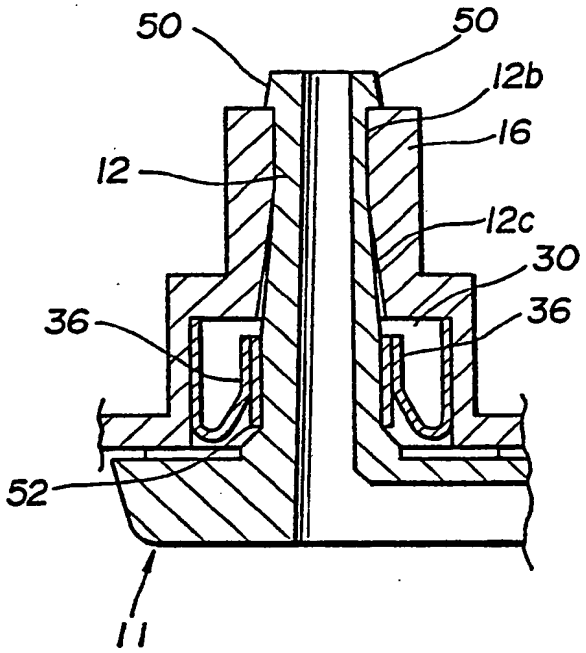
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FIG. 23

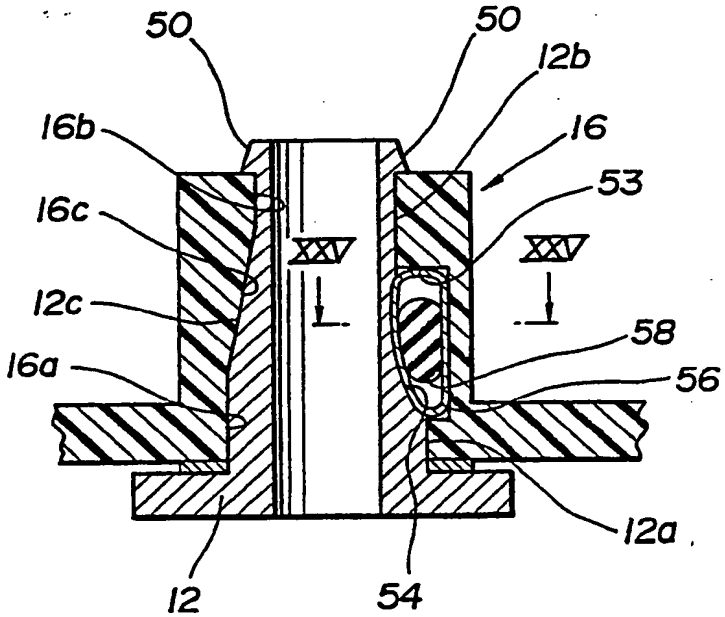
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FIG. 24

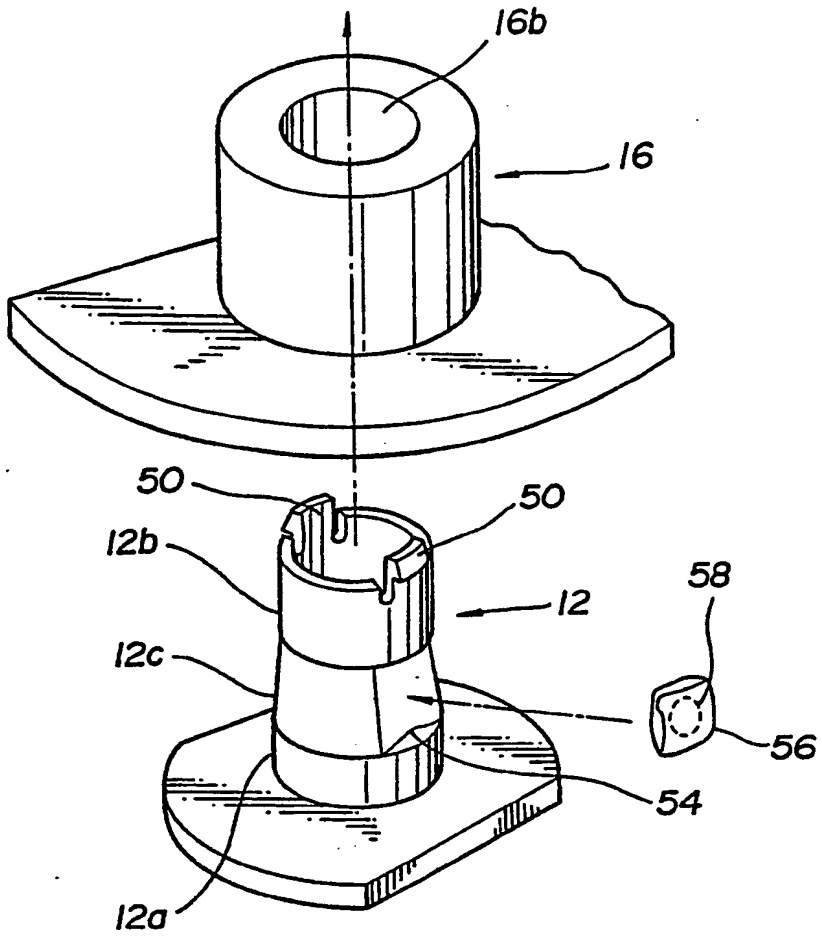



FIG. 25

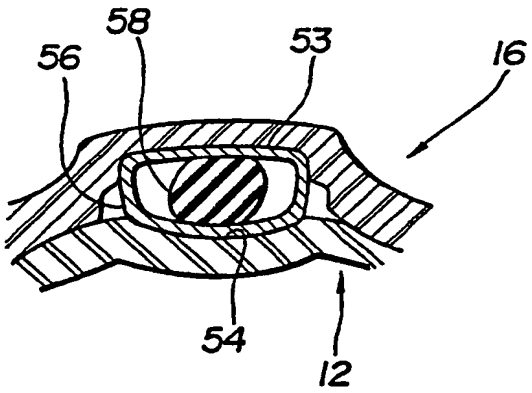
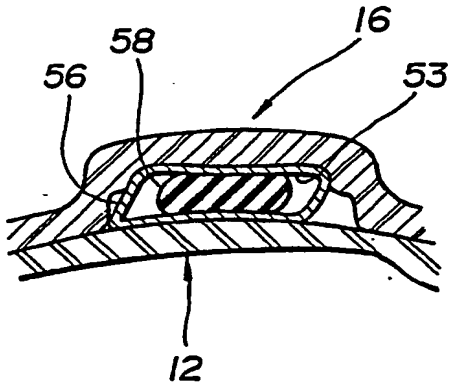



FIG. 26



# INTERNATIONAL SEARCH REPORT

International Application No PCT/JP88/00709

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl[4] B60R1/06

## II. FIELDS SEARCHED

Minimum Documentation Searched [7]

| Classification System | Classification Symbols |
|---|---|
| IPC | B60R1/06 |

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

| | |
|---|---|
| Jitsuyo Shinan Koho | 1971 - 1988 |
| Kokai Jitsuyo Shinan Koho | 1971 - 1988 |

## III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

| Category * | Citation of Document, [11] with indication, where appropriate, of the relevant passages [12] | Relevant to Claim No. [13] |
|---|---|---|
| X | JP, A, 61-77540 (Aisin Seiki Co., Ltd.) 21 April 1986 (21. 04. 86) Page 2, lower left column, lines 13 to 17, Fig. 1. (Family: none) | 1 |
| Y | JP, A, 61-122047 (Tokai Rika Co., Ltd.) 10 June 1986 (10. 06. 86) Page 5, upper left column, line 16 to upper right column, line 14, Figs. 3, 6, 7 (Family: none) | 5-7 |

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

## IV. CERTIFICATION

| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report |
|---|---|
| October 14, 1988 (14. 10. 88) | October 31, 1988 (31. 10. 88) |
| **International Searching Authority** | **Signature of Authorized Officer** |
| Japanese Patent Office | |

Form PCT ISA.210 (second sheet) (January 1985)